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SOLAR PV ROOF-MOUNT RACKING FRAME ASSESSMENT REPORT

SUNLOCK COMMERCIAL TILT-MOUNT & EAST-WEST SYSTEM

Prepared for:

Sunlock Australia Pty Ltd

Unit 12, 25 Huntingdale Road,

Burwood VIC 3125

April 13, 2020

Ref: E20030114

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OVERVIEW

This structural assessment report is issued for Sunlock Commercial Roof Tilt-mount and East-West racking systems, which are assessed against relevant Australian Standards and regulations. The assessment is carried out based on sound engineering methodologies. Assessment specifications and findings are given in the following sections.

AUSTRALIAN STANDARDS

- AS/NZS 1170.0:2002 – Structural design actions, Part 0: General principles
- AS/NZS 1170.1:2002 (R2016) – Structural design actions, Part 1: Permanent, imposed and other actions
- AS/NZS 1170.2:2011 (R2016) – Structural design actions, Part 2: Wind actions
- AS/NZS 1664:1997 – Aluminum Structures
- AS/NZS 4600:2018 – Cold-Formed Steel Structures

ASSESSED PV RACKING FRAME COMPONENTS

The following products by Sunlock Australia Pty Ltd are assessed against relevant Australian Standards and building regulations based on the specified conditions. The product detail drawings are attached in Appendix.

Assessed Components	Component Number	Material
Rail	SLSCC3	AL 6005-T5
Rail Joiner/Splice	SLCJ2	AL 6005-T5
Fixing Foot	SLCF2	AL 6005-T5
Tilt Leg	SLCTL2-10	AL 6005-T5
Tilt Leg	SLCTL2-15	AL 6005-T5
PV Panel Clamp	SL-V03-0045.A100	AL 6005-T5

ASSESSMENT CONDITIONS

- Solar PV system design life of 25 years
- Wind region A & B
- Terrain category 2 & 3
- Ultimate wind recurrence interval of 200 years
- Maximum average roof height of 20m
- Tilt angle to roof surface of 10º and 15º
- One-way tilted and East-West configurations are checked (refer to installation manual)
- Solar PV panel size is 2000mm x 1000mm
- Self-weight of solar PV panel and racking frame is 0.15kPa
- Solar PV panel is supported by 2 rails minimum
- Penetrative fixing is assumed to be fixed into 1.9BMT G450 steel or JD4 seasoned timber

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- Racking frame information is taken from “Sunlock Commercial Roof Installation Manual V.2.2” by Sunlock Australia Pty Ltd, dated Feb 2020; refer to Appendix for frame components details

IMPORTANT NOTES

- ***This report is issued based on assessments of solar PV racking frame system and its fixing connection to building structure. It does not take the structural capacity of building structure and solar PV panel into account due to the nature of general application.***
- ***The attached spacing tables must be read in conjunction with foot notes and general notes.***
- ***The spacing tables are inaccurate if the minimum fixing requirement of 1.9BMT G450 steel or JD4 seasoned timber is not met.***

CONCLUSION

The above-mentioned solar PV roof-mount racking frame systems by Sunlock Australia Pty Ltd are found structurally sound against relevant Australian Standards given installation fixing spacing as per the attached tables. Installation shall be conducted following the manufacturer’s guidelines.

Prepared by:

Zhichao Zhang
B.Eng (Civil), M.Eng (Structural), MIEAust, RBP(EC 59096)

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Interface Spacing Table for Roof Height H ≤5m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	2000	1865
	Intermediate Zone	1388	1217
	Edge Zone	1016	894
	Corner Zone	662	584
B	Internal Zone	1428	1252
	Intermediate Zone	921	811
	Edge Zone	680	599
	Corner Zone	446	394

Interface Spacing Table for Roof Height 5m <H ≤10m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	2000	1865
	Intermediate Zone	1388	1217
	Edge Zone	1016	894
	Corner Zone	662	584
B	Internal Zone	1428	1252
	Intermediate Zone	921	811
	Edge Zone	680	599
	Corner Zone	446	394

Interface Spacing Table for Roof Height 10m <H ≤15m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1844	1631
	Intermediate Zone	1192	1047
	Edge Zone	876	771
	Corner Zone	572	505
B	Internal Zone	1226	1076
	Intermediate Zone	794	700
	Edge Zone	587	518
	Corner Zone	386	341*

Interface Spacing Table for Roof Height 15m <H ≤20m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1651	1445
	Intermediate Zone	1060	932
	Edge Zone	780	687
	Corner Zone	511	451
B	Internal Zone	1089	957
	Intermediate Zone	708	624
	Edge Zone	524	463
	Corner Zone	345*	305*

NOTES:
1. * denotes the situations where the wind load is more than 5KPa and the installation safety is compromised.
2. Definition of Terrain Category is given in General Note 1.
3. Notion of Roof Zone is given in General Note 2.
4. Panel tilt angle is given in reference to roof surface
5. The spacing table is based on the fixing condition specified in General Note 3.

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Interface Spacing Table for Roof Height H ≤5m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1775	1552
	Intermediate Zone	1136	998
	Edge Zone	835	736
	Corner Zone	546	482
B	Internal Zone	1168	1026
	Intermediate Zone	758	668
	Edge Zone	561	495
	Corner Zone	369*	326*

Interface Spacing Table for Roof Height 5m ＜H ≤10m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1439	1262
	Intermediate Zone	928	817
	Edge Zone	685	604
	Corner Zone	449	397
B	Internal Zone	954	839
	Intermediate Zone	622	549
	Edge Zone	461	407
	Corner Zone	304*	269*

Interface Spacing Table for Roof Height 10m ＜H ≤15m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1293	1135
	Intermediate Zone	837	737
	Edge Zone	618	546
	Corner Zone	406	359*
B	Internal Zone	860	757
	Intermediate Zone	562	496
	Edge Zone	417	368*
	Corner Zone	275*	243*

Interface Spacing Table for Roof Height 15m ＜H ≤20m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1216	1068
	Intermediate Zone	788	695
	Edge Zone	583	515
	Corner Zone	383*	339*
B	Internal Zone	810	713
	Intermediate Zone	530	468
	Edge Zone	393	348*
	Corner Zone	260*	230*

NOTES:
1. * denotes the situations where the wind load is more than 5KPa and the installation safety is compromised.
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4. Panel tilt angle is given in reference to roof surface
5. The spacing table is based on the fixing condition specified in General Note 3.

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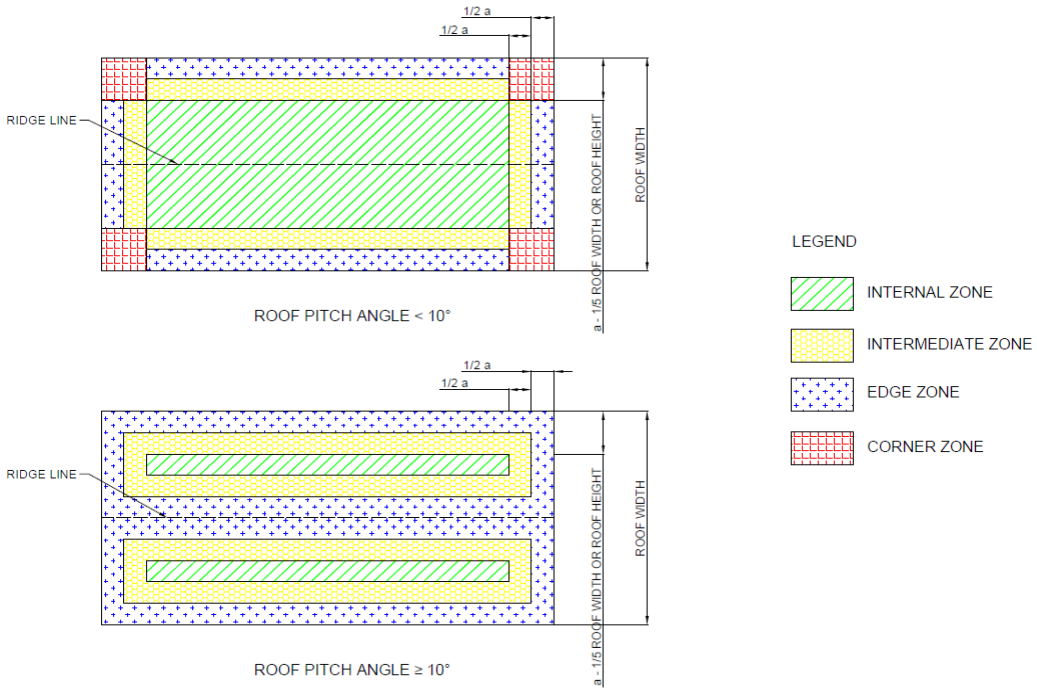
General Notes

Note 1 Terrain Category 3 (TC 3) denotes terrain with numerous closely spaced obstructions having heights generally from 3m to 10m. The minimum density of obstructions shall be at least the equivalent of 10 house-size obstructions per hectare.

Terrain Category 2 (TC 2) denotes open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5m to 5m, with no more than two obstructions per hectare.

Refer to AS/NZS1170.2-2011(R2016) Chapter 4.2.1 for Terrain Category definitions.

Note 2 Notion of Roof Zone is as shown in the following figure. "a" is the smaller number between roof height and 1/5 of roof width.



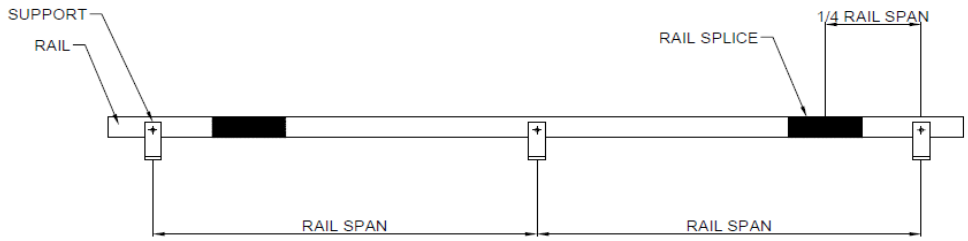
Refer to AS/NZS1170.2-2011(R2016) Chapter 5.4.4 for Roof Zone notion.

Note 3 Fixing spacing in the above tables are based on 14 gauge penetrative fixing pull-out capacity into 1.9BMT steel and 35mm embeded into JD4 seasoned timber. The fixing spacing must be adjusted if the roof structure being fixed into does not met the minimum requirements. The recommended typical penetrative fixings to be adopted are as following:

Steel purlin/batten	-	ST6.3 or 14g-10TPI Self-drilling Metal Screw
Timber purlin/batten	-	ST6.3 or 14g-10TPI Self-drilling Timber Screw

All self-drilling penetrative fixing must be in compliance with AS3566-2002(R2015).

Note 4 To ensure the fixing spacing in above tables are valid, rail splice connectors must not be installed at the support point or at the middle span point between two adjacent supports. It is recommended to install the connector at 1/4 span points from the supports.



Note 5 6 panel clamps (SL-V03-0045.A100) are required per panel for installation in **corner zone** for the following scenarios:
1) Wind region B, 10° installation on a roof higher than 10m;
2) Wind region B, 15° installation on a roof higher than 5m.

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Interface Spacing Table for Roof Height H ≤5m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	2000	2000
	Intermediate Zone	1555	1424
	Edge Zone	1135	1042
	Corner Zone	737	678
B	Internal Zone	1600	1464
	Intermediate Zone	1028	944
	Edge Zone	757	696
	Corner Zone	496	456

Interface Spacing Table for Roof Height 5m ＜H ≤10m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	2000	2000
	Intermediate Zone	1555	1424
	Edge Zone	1135	1042
	Corner Zone	737	678
B	Internal Zone	1600	1464
	Intermediate Zone	1028	944
	Edge Zone	757	696
	Corner Zone	496	456

Interface Spacing Table for Roof Height 10m ＜H ≤15m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1958	1869
	Intermediate Zone	1334	1222
	Edge Zone	977	897
	Corner Zone	637	586
B	Internal Zone	1371	1256
	Intermediate Zone	886	814
	Edge Zone	654	601
	Corner Zone	429	395

Interface Spacing Table for Roof Height 15m ＜H ≤20m, Terrain Category 3 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1837	1693
	Intermediate Zone	1184	1086
	Edge Zone	870	799
	Corner Zone	568	523
B	Internal Zone	1217	1116
	Intermediate Zone	789	725
	Edge Zone	583	537
	Corner Zone	384*	353*

NOTES:
1. * denotes the situations where the wind load is more than 5KPa and the installation safety is compromised.
2. Definition of Terrain Category is given in General Note 1.
3. Notion of Roof Zone is given in General Note 2.
4. Panel tilt angle is given in reference to roof surface
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Interface Spacing Table for Roof Height H ≤5m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1908	1821
	Intermediate Zone	1270	1165
	Edge Zone	932	856
	Corner Zone	608	559
B	Internal Zone	1306	1197
	Intermediate Zone	845	776
	Edge Zone	624	574
	Corner Zone	410	378*

Interface Spacing Table for Roof Height 5m ＜H ≤10m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1613	1476
	Intermediate Zone	1036	951
	Edge Zone	763	701
	Corner Zone	500	460
B	Internal Zone	1065	977
	Intermediate Zone	692	637
	Edge Zone	513	472
	Corner Zone	338*	311*

Interface Spacing Table for Roof Height 10m ＜H ≤15m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1448	1326
	Intermediate Zone	933	857
	Edge Zone	689	633
	Corner Zone	452	416
B	Internal Zone	959	881
	Intermediate Zone	625	575
	Edge Zone	464	427
	Corner Zone	306*	282*

Interface Spacing Table for Roof Height 15m ＜H ≤20m, Terrain Category 2 (Unit: mm)			
Wind Region	Panel Tilt Angle / Roof Zone	10°	15°
A	Internal Zone	1361	1247
	Intermediate Zone	879	808
	Edge Zone	649	597
	Corner Zone	426	392
B	Internal Zone	903	830
	Intermediate Zone	589	542
	Edge Zone	437	403
	Corner Zone	289*	266*

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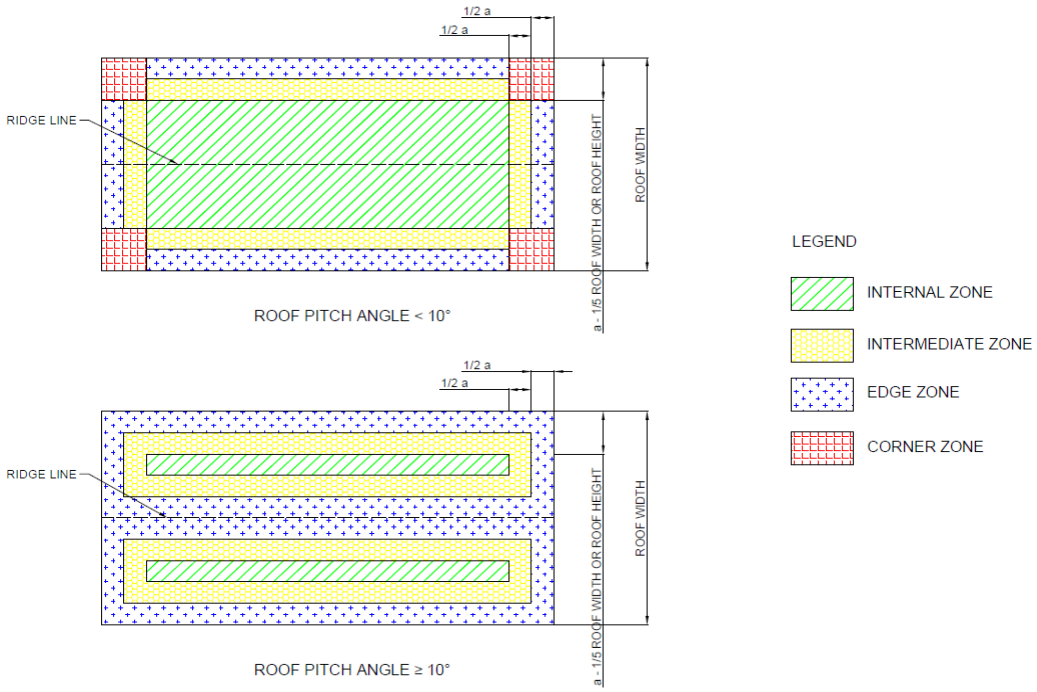

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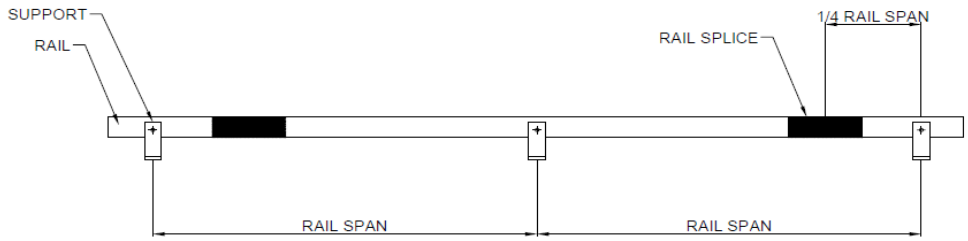

Note 5 6 panel clamps (SL-V03-0045.A100) are required per panel for installation in **corner zone** for the following scenarios:
1) Wind region B, 10° installation on a roof higher than 15m;
2) Wind region B, 15° installation on a roof higher than 10m.

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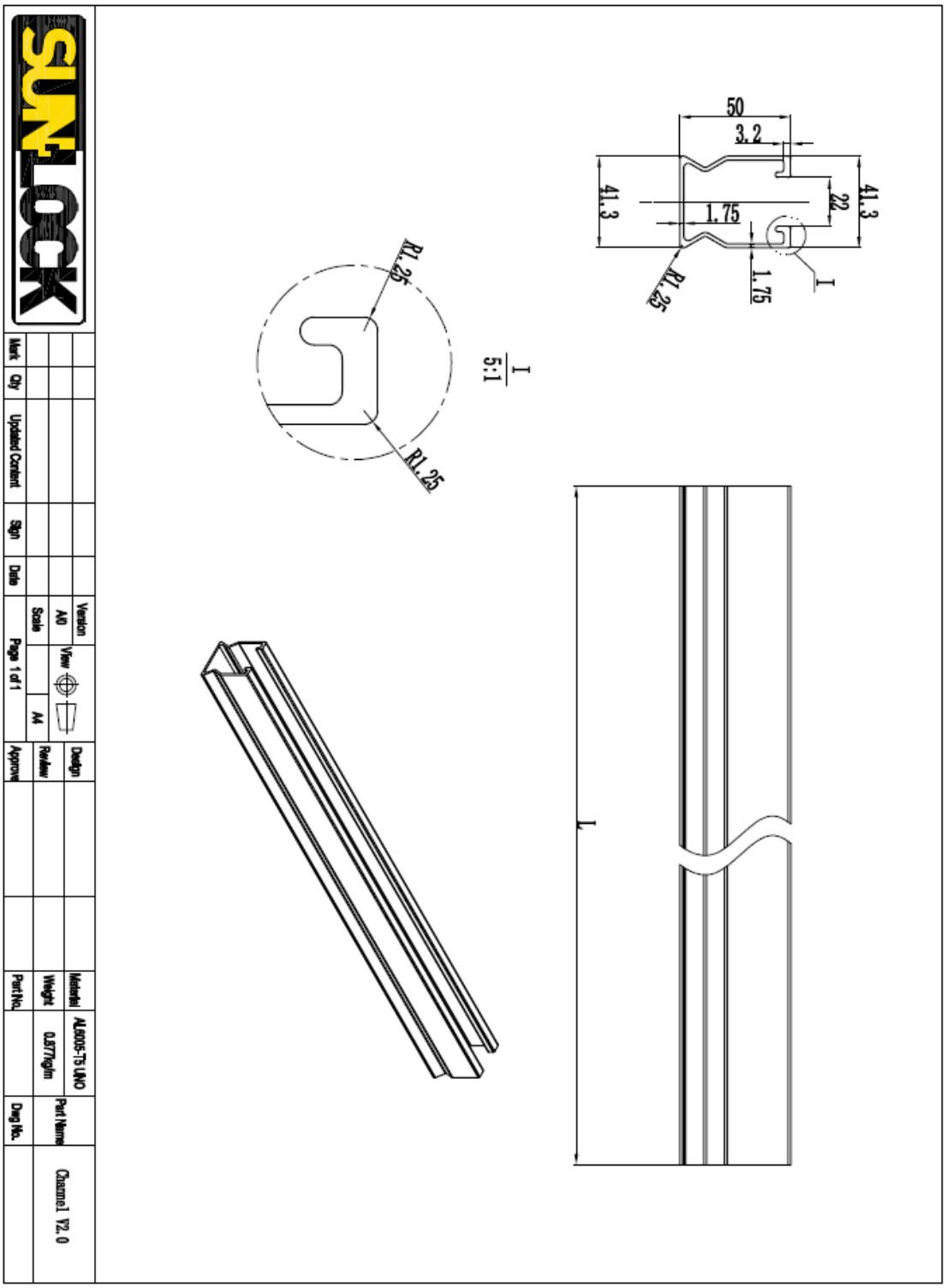
APPENDIX – ASSESSED RACKING FRAME COMPONENTS



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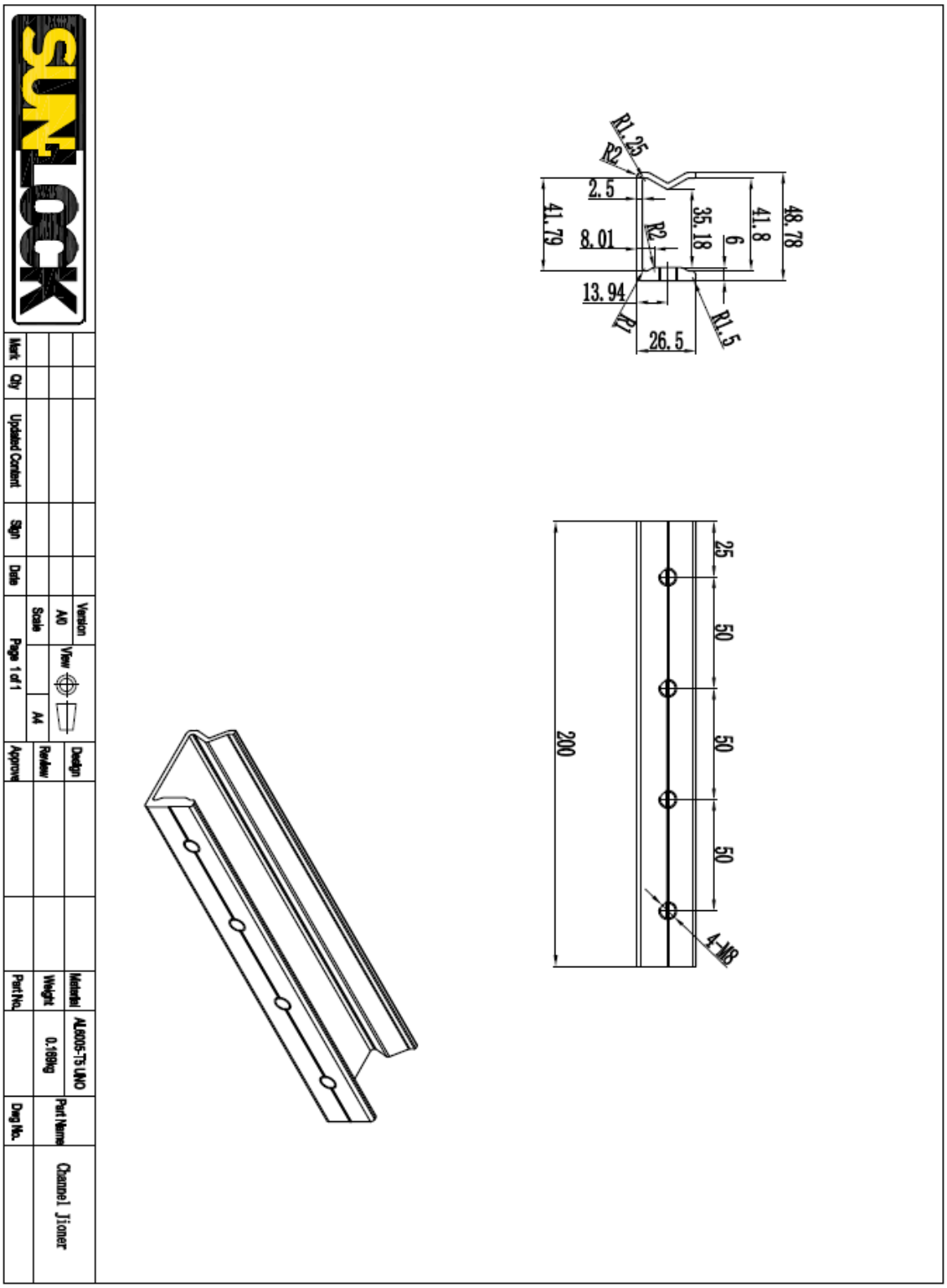

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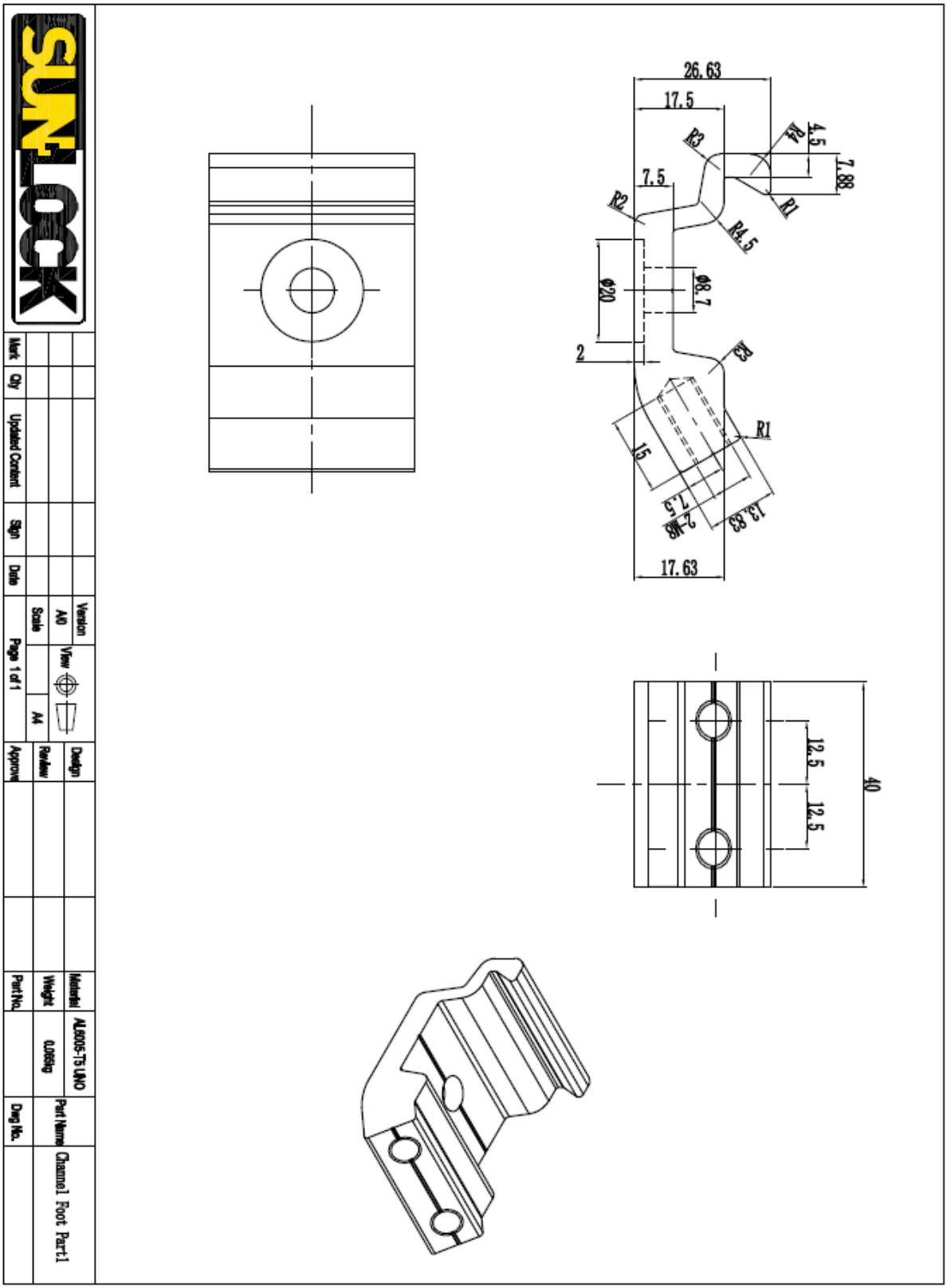

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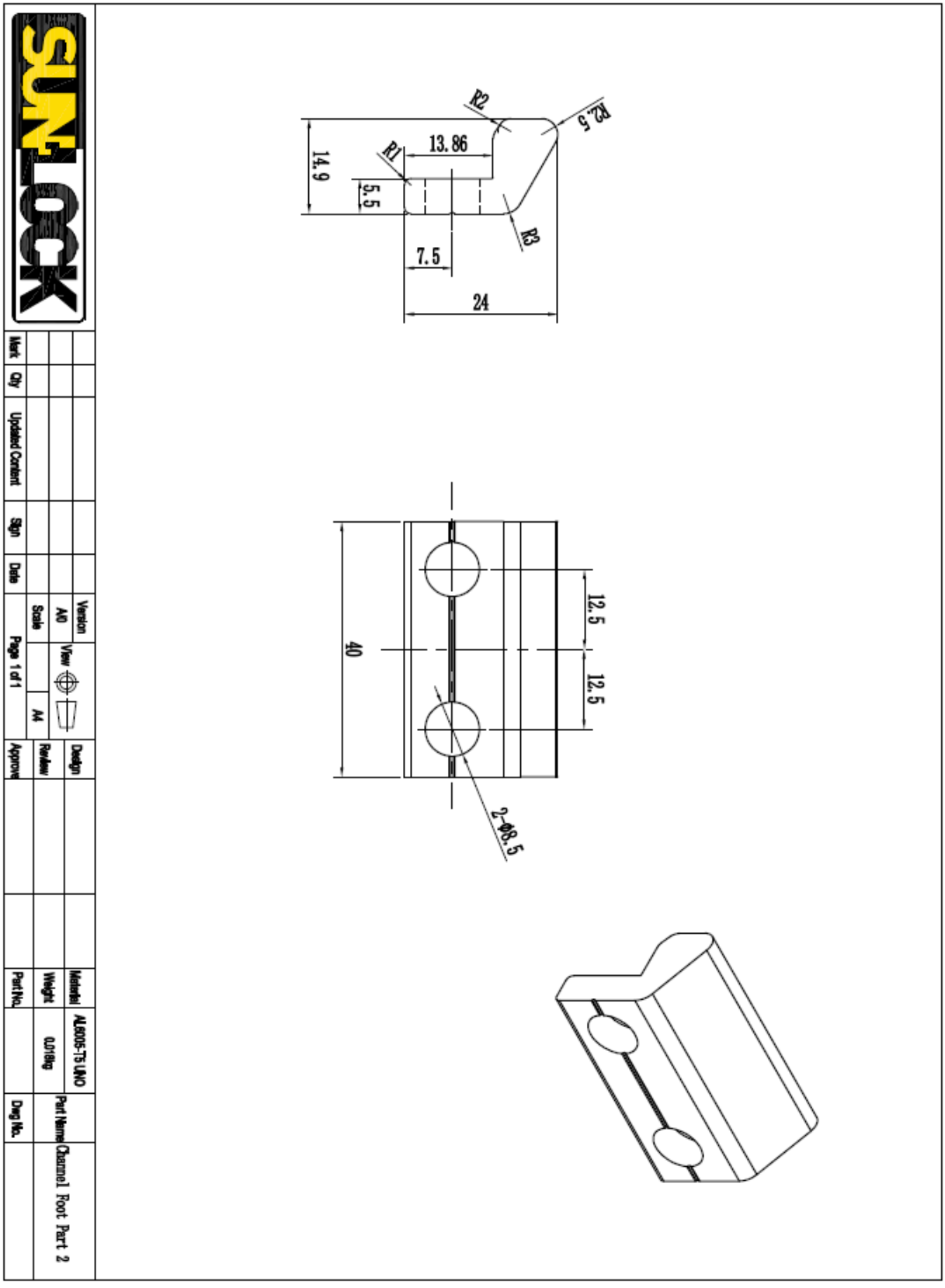

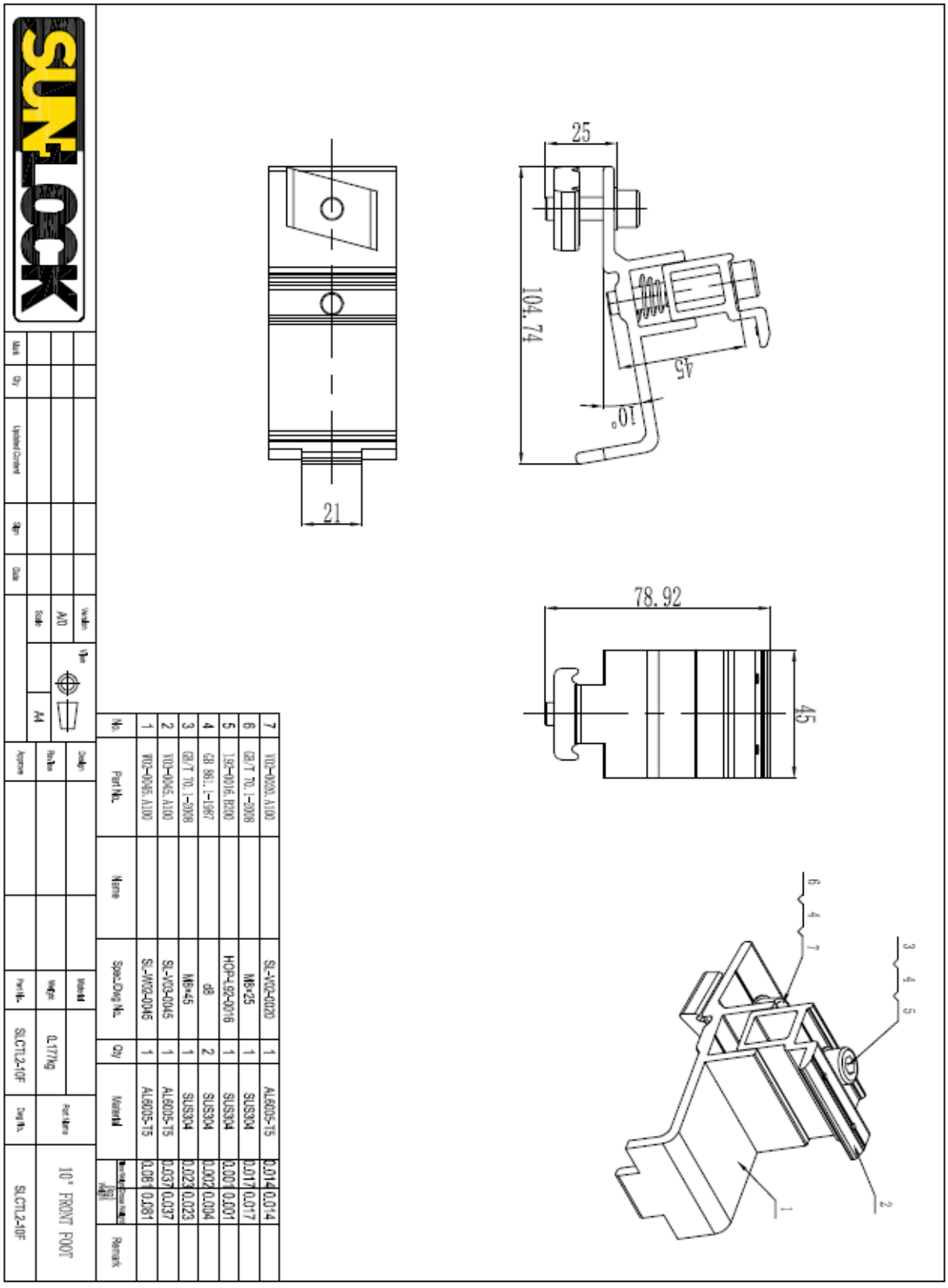
SUNLOCK
25
104.74
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10° FRONT FOOT
SLCTL2-10F

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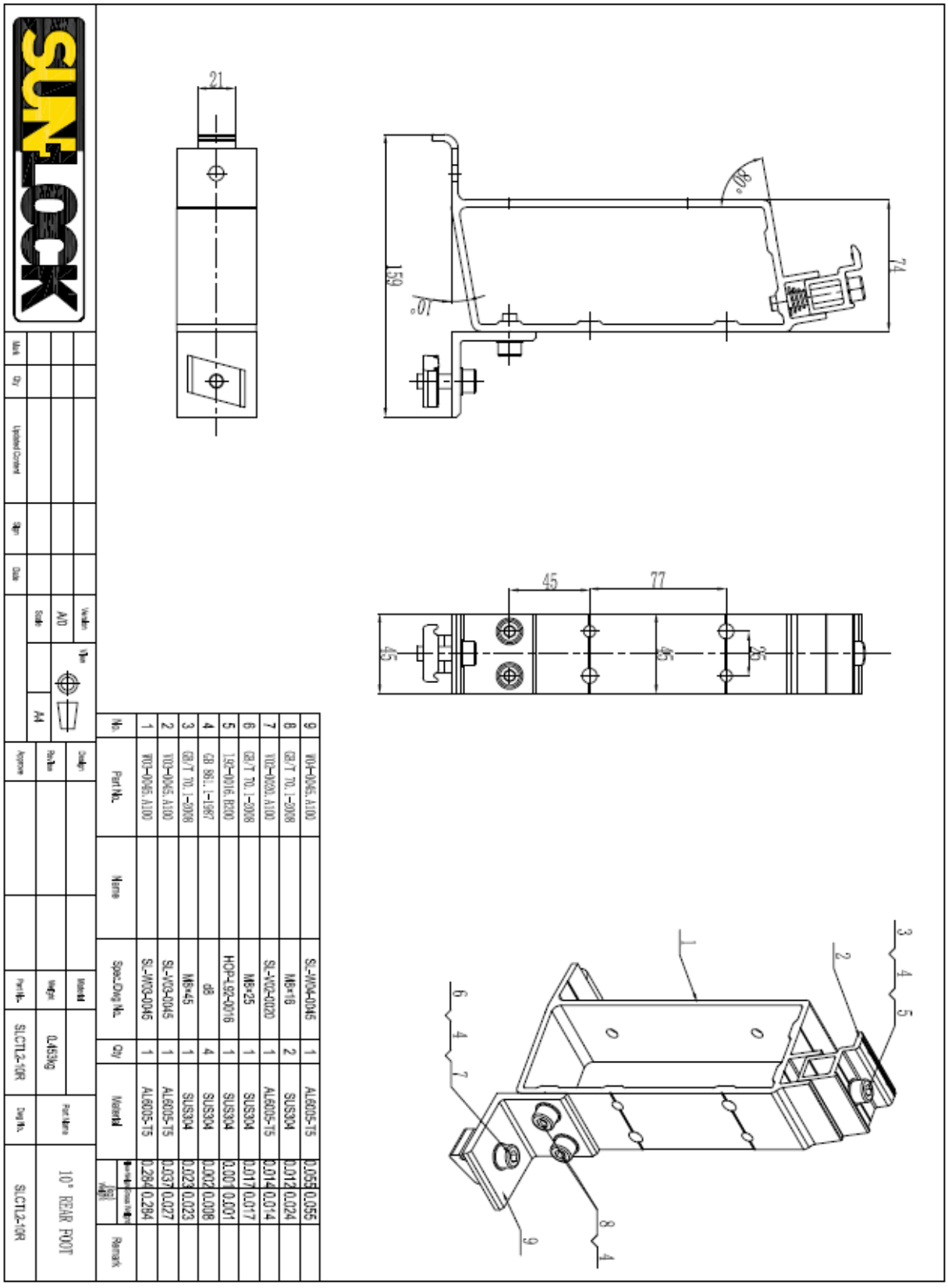
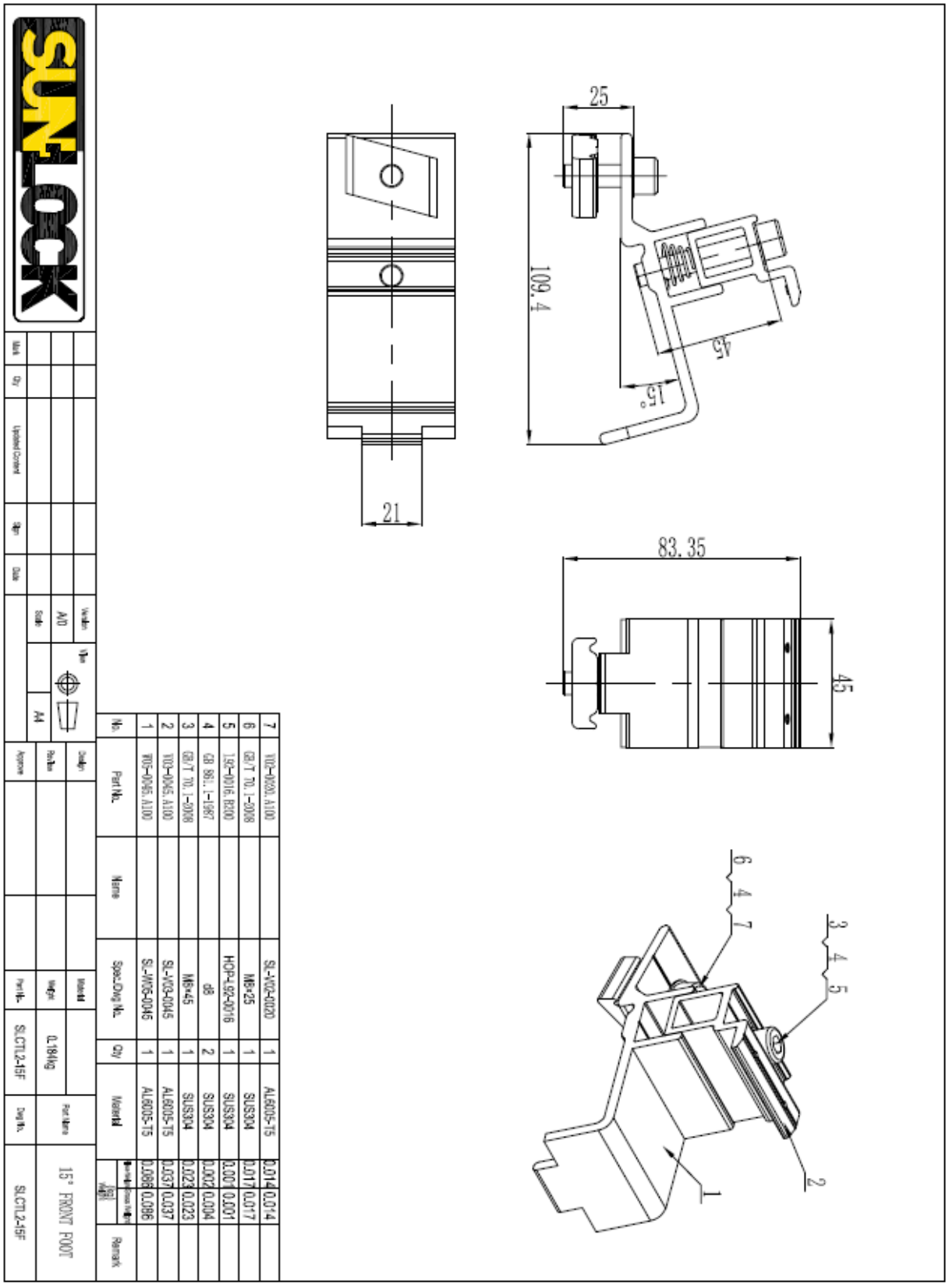


No.	Part No.	Name	Spec./Dwg No.	Qty	Material	Weight (kg)	Remark
9	WDI-HX45.A100		SL-HW04-0045	1	AL6005-T5	0.055	0.055
8	GB/T 70.1-2008		M8×16	2	SUS304	0.012	0.024
7	WDI-HX01.A100		SL-HX01-0020	1	AL6005-T5	0.014	0.014
6	GB/T 70.1-2008		M8×25	1	SUS304	0.017	0.017
5	JJG-HX16.R200		HCP-SZ-0016	1	SUS304	0.001	0.001
4	GB 93-1987		Φ8	4	SUS304	0.002	0.008
3	GB/T 70.1-2008		M8×45	1	SUS304	0.023	0.023
2	WDI-HX45.A100		SL-HX03-0045	1	AL6005-T5	0.037	0.037
1	WDI-HX45.A100		SL-HW03-0045	1	AL6005-T5	0.284	0.284



No.	Part No.	Name	Spec./Dwg No.	Qty	Material	Weight (kg)	Remark
7	10D-VK02-A0020		SL-VK02-A0020	1	AL6005-T5	0.014	0.014
6	GB/T 70.1-2008		M6×25	1	SUS304	0.017	0.017
5	13D-VD16.R200		HCP-92-D016	1	SUS304	0.001	0.001
4	GB 96.1-1987		d8	2	SUS304	0.002	0.004
3	GB/T 70.1-2008		M6×45	1	SUS304	0.023	0.023
2	10D-VD45.A100		SL-VK03-D045	1	AL6005-T5	0.037	0.037
1	10D-VD45.A100		SL-VK05-D045	1	AL6005-T5	0.086	0.086

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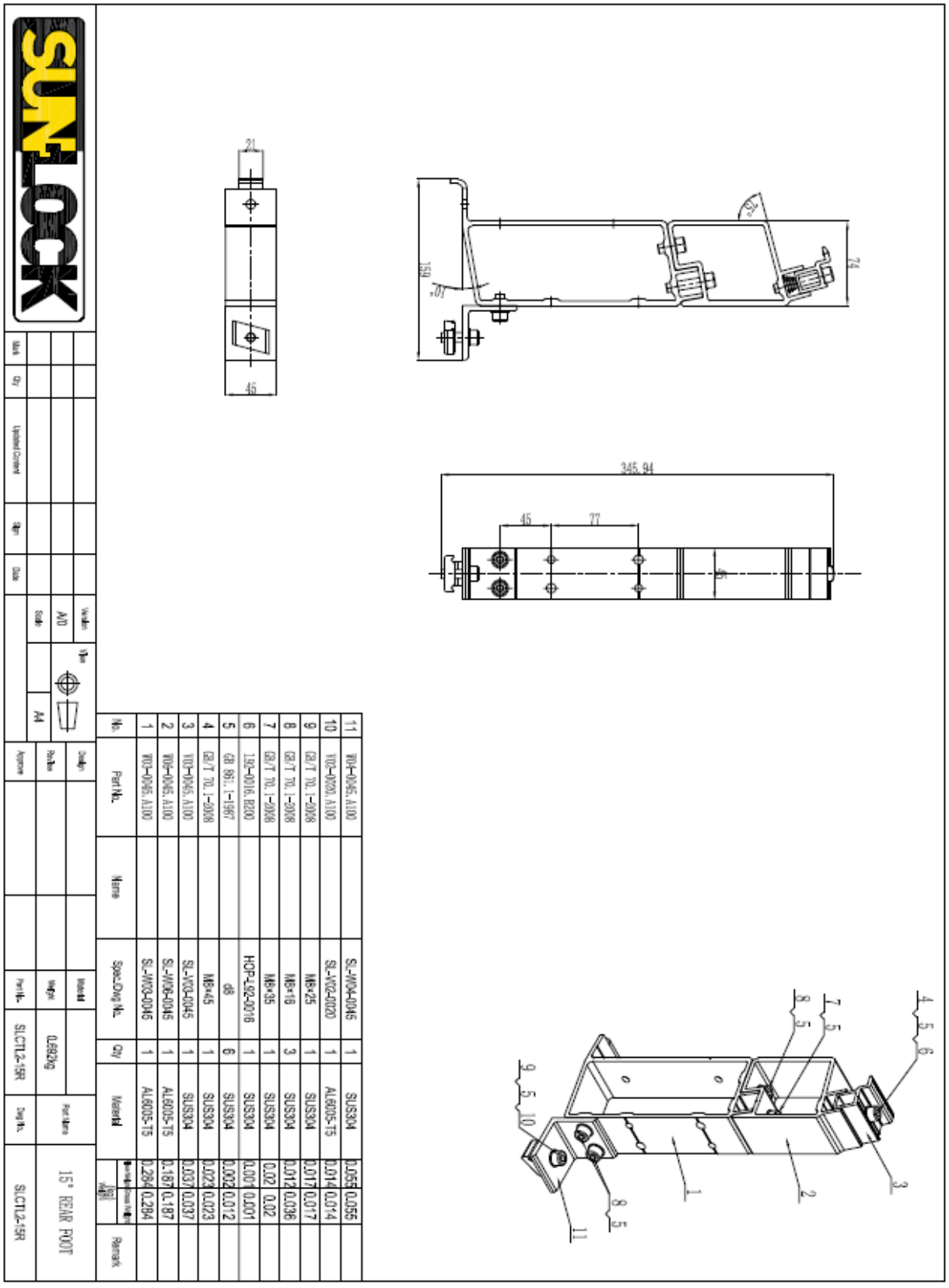

No.	Part No.	Name	Spec./Dwg No.	Qty	Material	Mass (kg)	Remark
11	10D-H0045.A100		SL-W004-0045	1	SUS304	0.055	0.055
10	10D-W020.A100		SL-W02-0020	1	AL6005-T5	0.014	0.014
9	GB/T 70.1-2008		M6×25	1	SUS304	0.017	0.017
8	GB/T 70.1-2008		M6×16	3	SUS304	0.012	0.036
7	GB/T 70.1-2008		M8×35	1	SUS304	0.02	0.02
6	19A-0016.B200		HDP-L92-0016	1	SUS304	0.001	0.001
5	GB 861.1-1987		d8	6	SUS304	0.002	0.012
4	GB/T 70.1-2008		M8×45	1	SUS304	0.023	0.023
3	10D-H0045.A100		SL-W004-0045	1	SUS304	0.037	0.037
2	10D-H0045.A100		SL-W004-0045	1	AL6005-T5	0.187	0.187
1	10D-H0045.A100		SL-W004-0045	1	AL6005-T5	0.284	0.284

Mark							
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	A4						
Approve	Review	Design					
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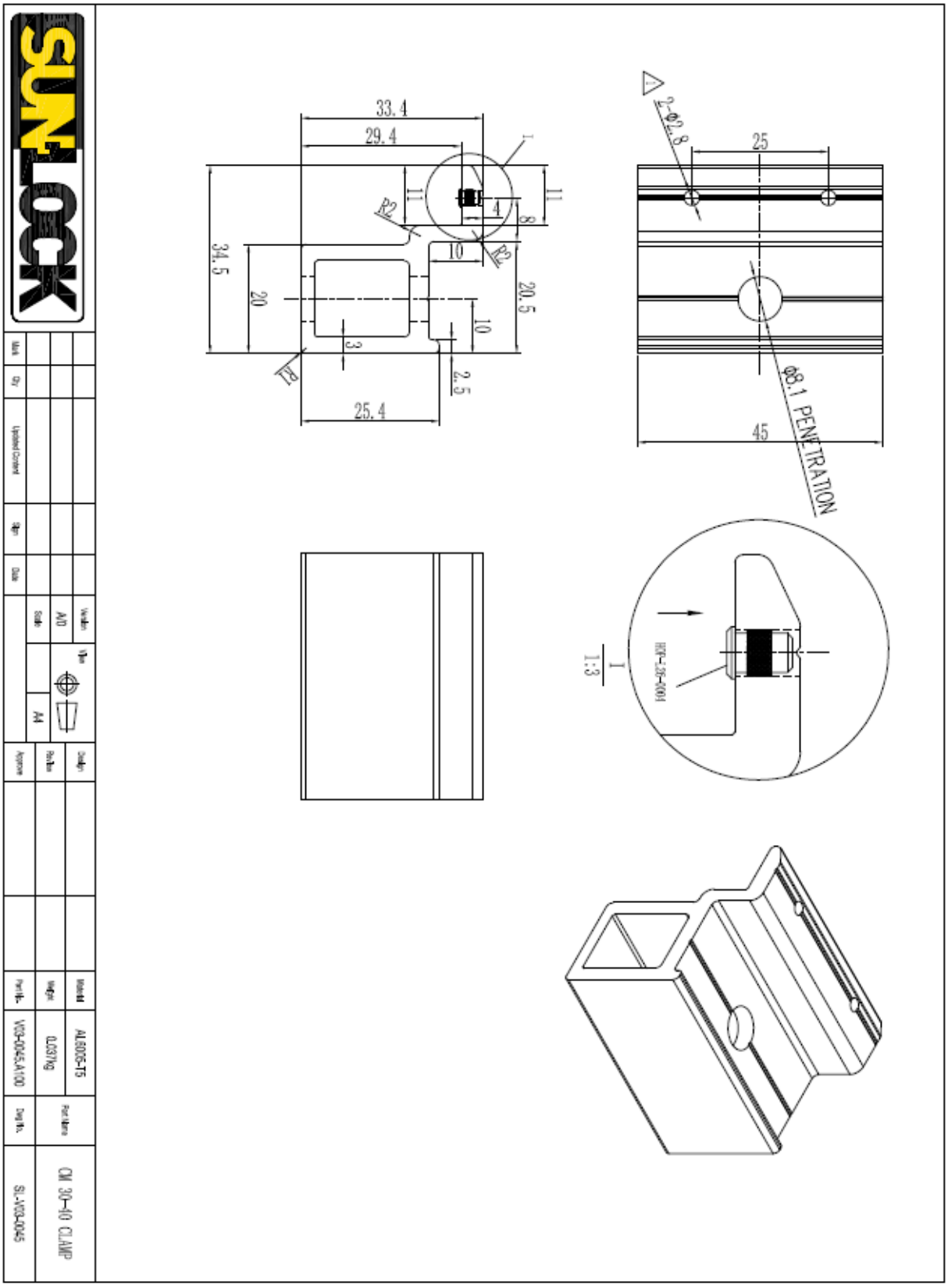
SLCTL2-15R							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Φ8.1 PENETRATION
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